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Land Use and Resource Development in the
Eastern Slopes - Athabasca - Yell 1



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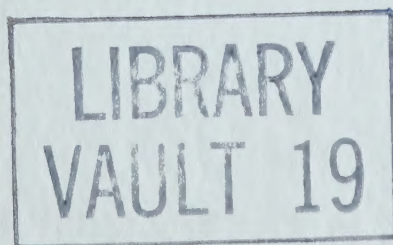
RESOURCES DEVELOPMENT

in the

EASTERN SLOPES

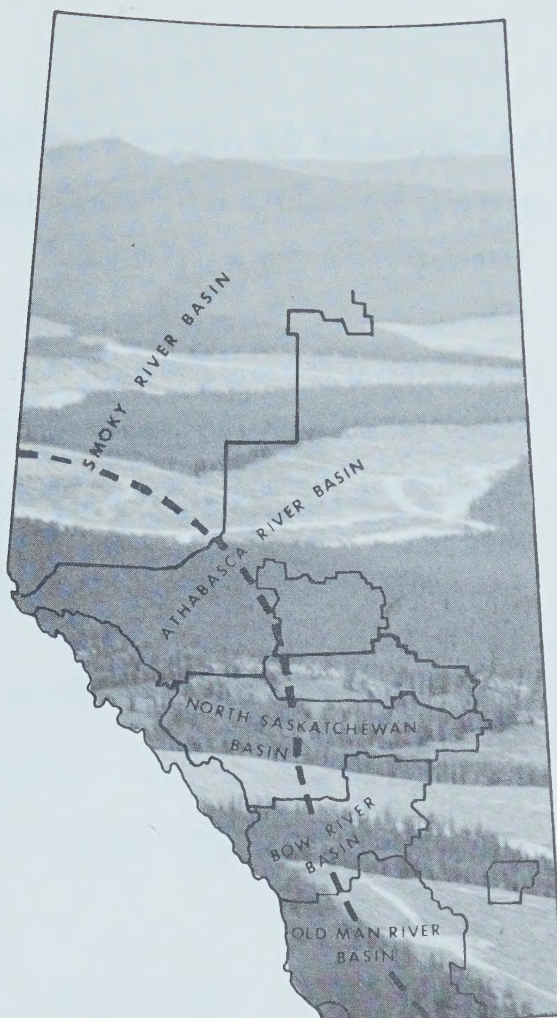
ATHABASCA - YELLOWHEAD AREA

REPORT BY PROVINCIAL PLANNING BRANCH
DEPARTMENT OF MUNICIPAL AFFAIRS



ENVIRONMENT CONSERVATION AUTHORITY
ALBERTA

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The Environment Conservation Authority
presents this publication as background
information for its upcoming public
hearings.

This material was prepared by an outside
agency and does not necessarily express
the views of the Environment Conservation
Authority.

LAND USE AND RESOURCE DEVELOPMENT IN THE
ATHABASCA RIVER BASIN: A DISCUSSION PAPER

May, 1973

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INTRODUCTION

The Government of Alberta through the Environment Conservation Authority will be conducting a series of public hearings on "Land Use and Resource Development in the Eastern Slopes." Submissions have been invited from all segments of the public in order to provide Albertans with an opportunity to make a significant contribution to policy formation and planning for the Eastern Slopes.

This report is one of a number of public information bulletins being distributed prior to the hearings. It provides a comprehensive description of the mountain and foothills portions of the Athabasca River Basin. This information does not constitute a plan for the area or is it complete and thorough in its discussion. The material is presented to provide the public with basic information while generating thought, discussion and response on policy, planning and use of this area.

THE ATHABASCA RIVER BASIN: A DESCRIPTION

Geographical Situation

The study area, outlined on Map 1, lies in west-central Alberta, directly west of Edmonton, and includes that portion of the Athabasca River drainage basin lying within the mountains and foothills. The region straddles the Yellowhead Corridor from just east of Edson to the boundary of Jasper National Park. The northern perimeter is defined by the Berland River while in the south, the Brazeau River provides an approximate boundary. The eastern boundary has been arbitrarily determined; its alignment was selected primarily to delineate the area within which land use conflicts and pressures for development were most likely to occur.

Physical Resume

In the Athabasca River Basin, the horizontal beds of the Interior Plains meet the up-turned strata of the Rocky Mountain system with a foothills complex marking the transition zone. As a result, the region contains extreme variations in topography, ranging from level to mountainous and generally increasing in relief in a southwesterly direction. The Rocky Mountain Front Ranges consist of a number of northwesterly trending ranges and valleys and are characterized by spectacular cliffs, U-shaped valleys and alpine structure. The high ranges are mostly bare of overlying surficial material and have elevations of up to 8,000 feet above sea level. The Rocky Mountain Foothills lie along the eastern margin of the Front Ranges with elevations ranging from 3,500 to 5,800 feet above sea level. Extreme variations in relative relief are common in the Foothills. The Interior Plains extend eastward from

the foothills and in this region consist of alternating tablelands and terraced valleys. Elevations range from 2,800 to 4,000 feet above sea level and local relief is much less pronounced.

The Athabasca River flows through the central portion of the region in a northeasterly direction. The Berland, Wildhay, McLeod and Pembina Rivers, while tributaries of the Athabasca River, are important waterways in their own right. The same applies to the Brazeau River as a branch of the North Saskatchewan River. Other significant tributaries include the Cardinal, Erith, and Embarras Rivers and Wolf, Pinto and Sundance Creeks.

The Athabasca River basin lies in the Boreal Climate zone which is characterized by long, severe winters and short summers, a wide variety of conditions and generally small amounts of precipitation. The following table summarizes the climatic data available for the region and includes information for the Jasper weather station which, although outside of the study area, is indicative of the mountainous portion of the region.

TABLE I

Temperature and Precipitation Summary

	<u>Edson</u>	<u>Embarras</u>	<u>Entrance</u>	<u>Jasper</u>
Annual mean temperature (°F)	35.3	30.1	36.7	37.3
July mean temperature (°F)	58.7	63.1	58.7	59.4
January mean temperature (°F)	8.4	- 8.6	12.6	11.5
Total annual precipitation (inches)	20.85	15.35	19.98	15.98
Annual snowfall (inches)	58.7	51.9	55.7	49.2





THE REGION AND ITS LOCATION IN ALBERTA



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The vegetative cover in the Athabasca River basin can be categorized into three major zones. The most easterly portion of the region has been cleared of native vegetation and is now dedicated to agricultural land uses. The area surrounding this zone is predominantly covered by deciduous stands with some mixedwood stands. The remainder of the region has relatively heavy stands of coniferous trees, indicative of its Boreal Forest character.

Administrative Units

The Athabasca River basin is wholly within Improvement District No. 14. Under the authority of the Improvement Districts Act, the Minister of Municipal Affairs through the Director of the Field Services Branch acts as the council for the municipality. Administration is carried out by an Improvement District Administrator located in the region, in this case Edson.

The majority of the region lies within the Green zone which was established in 1948 to provide a permanent land base for timber growth and to restrict the erratic expansion of agricultural uses onto lands with little if any capability for those uses. The land classification map produced by the Department of Lands and Forests in 1971 states that the Green zone includes forest lands not available for agricultural development other than grazing and that public lands are managed for the multiple use of resources.

The planning authority in this region is the Provincial Planning Board through the Provincial Planning Branch. This agency is responsible for administering those powers and duties set down in The Planning Act. All subdivision of





TOPOGRAPHY

(CONTOUR INTERVAL = 200' TO 500')



MAY, 1973



land must be approved by the Provincial Planning Branch in accordance with the provisions of The Planning Act and The Subdivision and Transfer Regulation . The Branch also acts as the planning agent for several of the municipalities, on request, and is currently conducting studies in the region leading to the development of a regional plan .

LAND USE AND RESOURCE ACTIVITY

Renewable Resource Use and Activity

Forest production dominates the land use pattern of the Athabasca River basin (See Map 3). The majority of the region is included in a Timber Management Agreement Area held by North Western Pulp and Power Ltd. The agreement provides to the company exclusive harvesting rights for commercial timber in the area, at specified dues rates and under specific conditions. The company is required to manage the area on the basis of sustaining the yield or flow of production indefinitely into the future. The agreement requires the company to conduct inventories and develop management and annual operating plans which meet with the approval of the Minister of Lands and Forests. The term of the agreement is 20 years but is renewable in perpetuity as long as the conditions set out in the agreement are satisfied. The timber from the agreement area is utilized in an integrated bleached sulphate pulp mill and sawmill operated by North Western Pulp and Power Ltd, which is located in Hinton.

The region also has 2 coniferous timber quotas in the southernmost portion. The Department of Lands and Forests establishes the amount of commercial timber in an area which may be cut annually on a sustained basis. A quota authorizing that amount of annual production is then offered for competitive sale with the highest bidder receiving the quota. Each quota holder is granted a series of timber licences authorizing the removal of the amount of timber specified in the quota. This region

also has 13 timber operating licences which are not within established quota areas. These occur in areas which formerly were held as reserve for the Timber Management Agreement Area. When the reserve status was terminated, the circumstances of these operators were recognized and reviewed and they were granted short-term timber operating licences.

Agricultural land uses are limited in this region both by the natural factors of climate and soil conditions and by the existence of the Green Zone. A narrow belt of agriculture extends into the region to just west of Edson. This area is primarily dedicated to the cultivation of cereal and tame hay crops, but the area appears to be undergoing a transition to livestock or mixed farming operations. Agriculture in this area has been characterized in the past by low farm incomes and small farms. These factors led to the designation of the area as the focus of a major A.R.D.A. (Agricultural Rehabilitation and Development Act) program in an attempt to resolve the problems and rationalize agriculture in the area. The only other significant area of agricultural land use in the region surrounds the town of Hinton and this area is primarily dedicated to livestock grazing.

Recreational land uses are scattered throughout the region with most being located adjacent to major roads. The region has a single provincial park - Entrance, 10 recreation areas operated by the Alberta Forest Service and 9 roadside campgrounds maintained by the Department of Highways and Transport. All of these provide the region with excellent opportunities for primitive camping but there exists a complete void of provincially operated serviced campgrounds. The area immediately east of the East Gate of Jasper National Park has 3 private facilities which provide tourist accommodation,



LEGEND

-  BOUNDARY OF TIMBER MANAGEMENT AGREEMENT AREA OF N.W.P.P. LTD.
-  TIMBER OPERATING LICENSE
-  CONIFEROUS QUOTA AREA
-  AGRICULTURAL LAND USES
-  PROVINCIAL PARK
-  PROVINCIAL CAMPGROUND
-  SKI HILL
-  MISCELLANEOUS LAND USES



RENEWABLE RESOURCE USE AND ACTIVITY

SCALE : MILES



MAY 1973



both camping and lodging, and extensive-type recreation activities such as trail riding and snowmobiling. Intensive activity sites are limited to 2 ski facilities, one serving the Hinton Ski Club and the other, Silver Summit, operating commercially and offering more extensive and sophisticated facilities. Recreation opportunities of an extensive nature are found throughout the region with excellent resources for hiking, hunting, fishing, viewing, canoeing, climbing and nature study.

Non-Renewable Resource Use and Activity

Prior to 1887 an individual or company could acquire ownership of subsurface mineral rights. These freehold rights are held in perpetuity and the government has only limited control over the use of the minerals in these areas. Since 1887, the ownership of all subsurface minerals not previously purchased has been retained by the Crown and the right to exploit these minerals has been allocated through various dispositions.

Long-term commitments for petroleum and natural gas have been allocated for approximately 52% of the Athabasca River basin. Most of these dispositions are for periods of 25 years, but are renewable until exploitation of the resource is completed. An additional 19% of the region has been committed to short-term petroleum and natural gas dispositions which are issued primarily for exploration or preliminary production activity but which are convertible to long-term if the resources warrant. Current production of petroleum and natural gas is limited in extent and is largely confined to the northeastern portion of the region. Four areas of production





LEGEND

-  PETROLEUM AND NATURAL GAS LEASES
-  PETROLEUM AND NATURAL GAS RESERVATIONS
-  NATURAL GAS LEASES AND LICENCES
-  COAL EXPLORATION RESERVATIONS
-  COAL LEASES

NON-RENEWABLE RESOURCE DISPOSITIONS

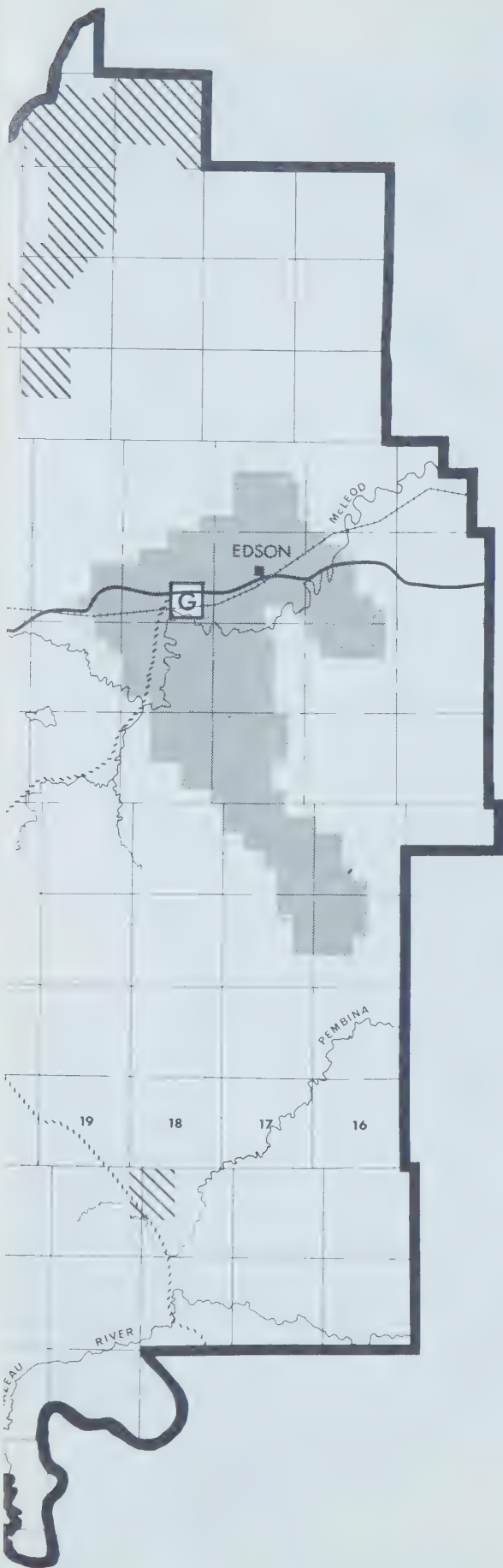


SCALE 1 MILES



MAY, 1973





LEGEND

-  OIL FIELD
-  GAS FIELD
-  GAS PROCESSING PLANT
-  COAL MINE
-  LIMESTONE QUARRY

PRESENT NON-RENEWABLE RESOURCE USE



MAY, 1973



can be identified: the Edson oil field and the Pine Creek, Marlboro and Lovett River gas fields. It should be noted that the area immediately east of the region is intensively developed for both oil and natural gas production and a westward progression of activity is evident. A single gas processing plant is located at Edson while all crude oil is transported outside of the region for refining. The eastern portion of the region has a well-developed network of both oil and natural gas pipelines with the Trans-Mountain Pipeline transecting the region through the Yellowhead Corridor.

Coal leases have been allocated for approximately 11% of the region, all of this located in a relatively narrow belt adjacent to the Front Ranges. In addition, coal exploration reservations have been issued for about 3% of the region. Prior to 1959, the Coal Branch area was a substantial producer of coal. However, the demise of the steam locomotive spelled a similar doom for the coal mines of this region. The tremendous requirement for coal for the Japanese market has recently produced a resurgence in interest in the coal resources of the region. In 1970, Cardinal River Coal Ltd. commenced an open-pit operation at Luscar which is presently the only operational mine in the region.

Limestone quarrying occurs only at Cadomin within the Athabasca River Basin. Sand and gravel leases are scattered throughout the region and are allocated as surface dispositions.



56

55

54

53

51

WILDHAY
RIVER

Sundance
Lake

ARR

HINTON

ATHABASCA
RIVER

HWY 15

C.N.R.

MELEOD
RIVER

Bridle Lake

Robb

Lusscar

Cadomin

22

21

10

BRADLEY



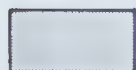
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EXCELLENT POTENTIAL



GOOD POTENTIAL



MODERATE POTENTIAL

POTENTIAL FOR OUTDOOR RECREATION



MAY, 1973



RESOURCE POTENTIAL AND EXISTING SUPPLY

An examination of resource supply must consider both the existing supply and the capability or potential of the environment based on the assumption of optimizing the productivity for that resource. The Canada Land Inventory provides information relating to the potential of the land to support various renewable resource uses and will be used as the foundation for the discussions of resource potential which follow.

Outdoor Recreation

In relation to the provincial supply pattern, the Athabasca River basin possesses considerable potential for outdoor recreation, with a concentration in the western portion of the region. Sites having excellent recreation potential are scattered in a narrow belt adjacent to the Front Ranges and are associated with the high relief situation which provides excellent opportunities for activities such as skiing, scenery appreciation and spelunking. Good recreation potential is also distributed throughout the far western portion of the region and has a diversity of attraction features including vegetation, scenery appreciation, camping and angling. Moderate recreation potential accrues to relatively large areas particularly in the northwestern part of the region. This potential is primarily focused on the numerous water courses which traverse the region and the upland areas immediately adjacent to them. Dominant features are usually related to shoreland activities, spectacular topography or landscape viewing.

Forestry

Virtually all of the Athabasca River basin has good or moderate potential for forest production. The best potential in the region occurs in the Coal Branch between

Robb and Hinton. This evaluation of productivity is based on commercial sawtimber production, however, this potential is substantially greater for pulpwood production.

Most of the region has either good or moderately good existing forest cover in terms of merchantable sawtimber with this capability again being significantly greater for pulpwood production. The area between the Athabasca and Berland Rivers contains the best forest cover in the region. The following table provides a tabulation of the total gross timber volume for the region.¹

TABLE II
TOTAL GROSS TIMBER VOLUME

Pulpwood (4" to 9" DBH)	-	Thousands of cords
Coniferous	-	28,917
Deciduous	-	7,474
Sawtimber (10" + DBH)		Millions of board feet
Coniferous	-	7,987
Deciduous	-	1,899
Total Equivalent Timber	-	Millions of cubic feet
Coniferous	-	3,965,681
Deciduous	-	994,339

Agriculture

Potential for agriculture is very limited in this region. Adverse climate and poor soils combine to virtually prohibit the cultivation of cereal grain or tame hay crops. Grazing potential is also quite limited in this region. The adverse topography, extreme climate, heavily treed cover and limited capability for winter grazing interact to provide

¹ These figures have been provided by the Timber Management Branch, Alberta Forest Service. The date of inventory varies from 1950 to 1963 but the figures are useful in that they provide an indication of the magnitude of the forest production capability.





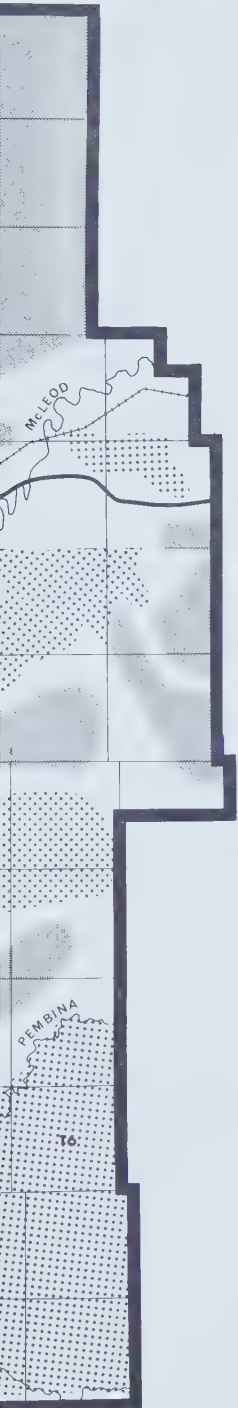
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GOOD POTENTIAL



MODERATE POTENTIAL



POTENTIAL FOR FOREST PRODUCTION

SCALE : MILES



MAY, 1973





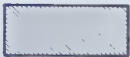
LEGEND



EXCELLENT WINTER RANGE



GOOD WINTER RANGE



EXCELLENT HABITAT



GOOD HABITAT

POTENTIAL FOR
UNGULATE
WILDLIFE

SCALE : MILES



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an environment which is not amenable to grazing.

Fish and Wildlife

The numerous rivers and streams and several small lakes are the major components of the fishery resource in the Athabasca River basin. Most of the small lakes are stocked annually and contain northern pike, rainbow trout, and some walleye. Rock Lake is unique in that it contains a thriving population of lake trout. Lake whitefish inhabit Fickle Lake and form the basis for a limited amount of commercial fishing. Stream fishing dominates the fishery resource of the region and offers a considerable variety of species including rainbow trout, brook trout, Arctic grayling, mountain whitefish, char and Dolly Varden. Northern pike and some walleye are found in the larger rivers and the downstream portions of the tributaries. Several of the streams are stocked with trout each year to supplement natural populations.

The entire region has moderate to excellent potential for ungulate production. However, wintering range is much less common and is very localized in nature. These areas are usually confined to major river valleys and have good to excellent capability. The existing supply of big game animals in the region is best illustrated by the following table:





LEGEND

-  HIGH COAL
-  MODERATE COAL
-  HIGH PETROLEUM AND NATURAL GAS
-  MODERATE PETROLEUM AND NATURAL GAS

POTENTIAL FOR SUBSURFACE RESOURCES



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precipitation as streamflow. Both the quantity and quality of the watershed must be protected if downstream demands for water supply are to be satisfied.

Coal

The western portion of the Athabasca River basin has considerable potential for coal with most of the high coal potential occurring in the northern Coal Branch area from Luscar and Robb to Hinton. Substantial reserves of coal are located in a narrow northwesterly belt and consist of low and medium volatile bituminous and high volatile bituminous, including both coking and non-coking varieties. The following table indicates the reserves for the region.³

TABLE IV
COAL RESERVES IN THE ATHABASCA RIVER BASIN

<u>Subregion</u>	<u>Area</u>	<u>Reserves (millions of tons)</u>
Foothills	Prairie Creek	420
	Coalspur	4,050
Mountains	Brule	1,450
	Mountain Park	3,400
	TOTAL RESERVES	9,320

Petroleum and Natural Gas

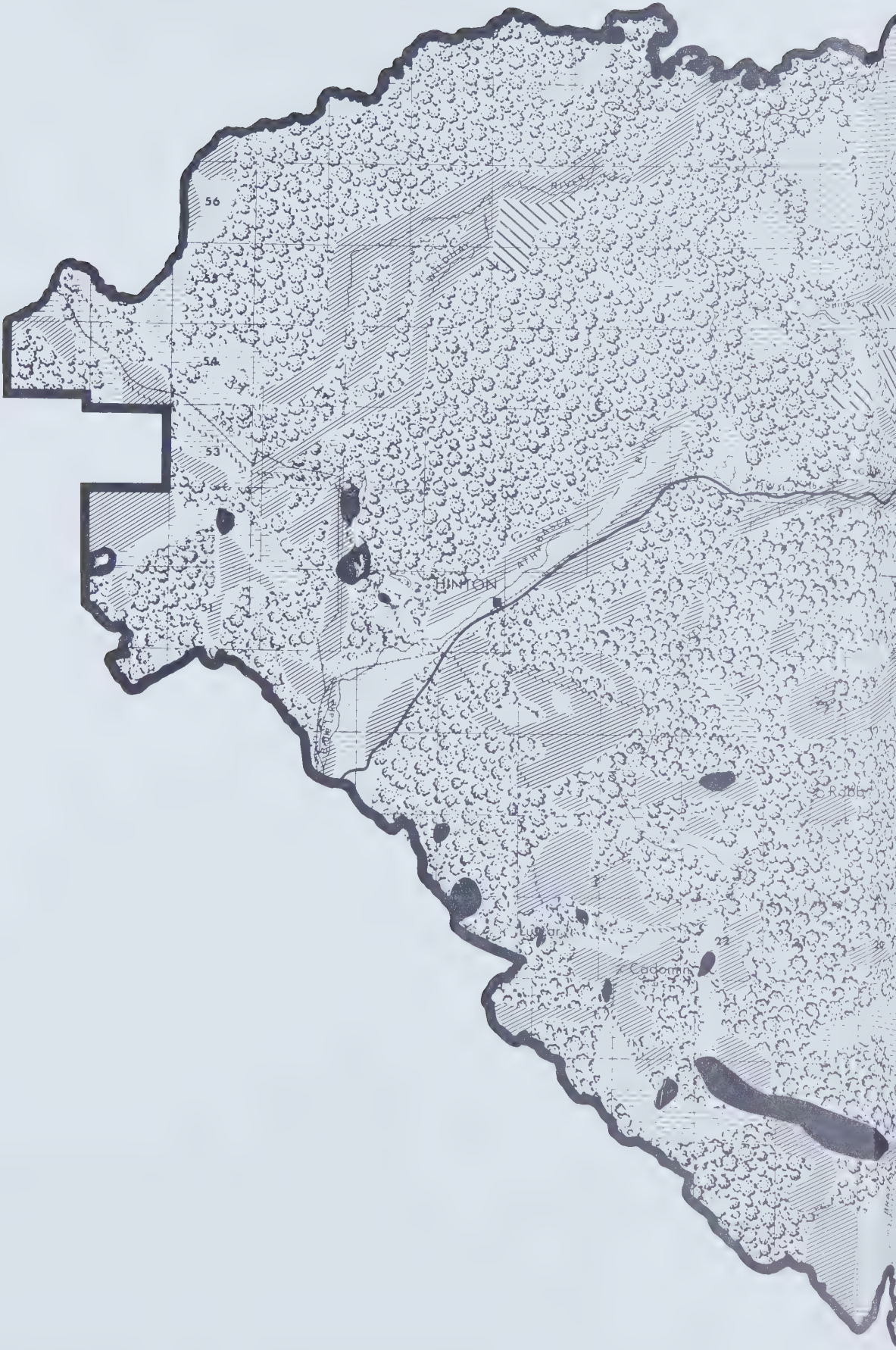
Virtually the entire eastern portion of the region has high or moderate potential for petroleum and natural gas development. As exploration work is completed

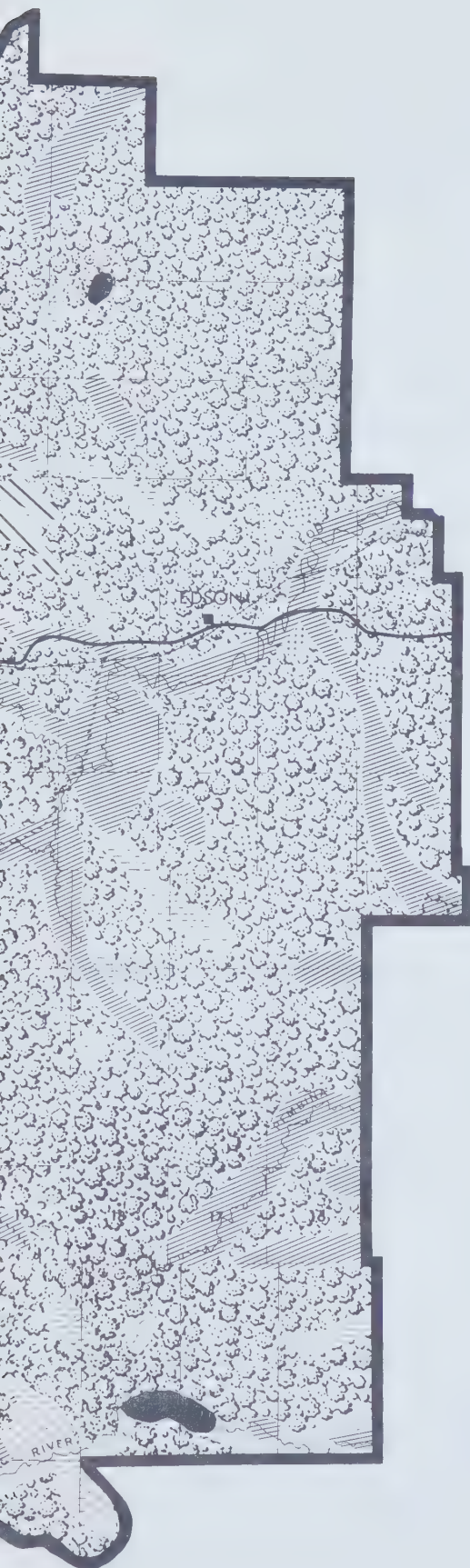
³ These figures have been provided by Mr. N. J. Duncan, Senior Engineer, Coal Division, Energy Resources Conservation Board and are based on B. R. MacKay's "Coal Reserves in Canada" (1946).

and detailed information becomes available, large areas in the western portion of the region may also be ascertained to have high or moderate potential.

Preferred Renewable Resource Allocation

Map 10 presents a simplified version of the preferred allocation for renewable resources for the region. Based on resource supply and potential, this allocation establishes which land use is physically best suited to each land unit while ensuring a safe minimum standard for those resources requiring protection. As might reasonably be expected, forestry dominates the resource allocation for the region. Intensive recreation sites are scattered in a narrow belt adjacent to the Front Ranges. Extensive recreation and ungulate production account for most river valleys and have some concentrations in the western portion of the region. Agriculture is virtually non-existent. Subsurface energy resource use, while of considerable importance, produces relatively short term disturbance of the surface and with this renewable resource allocation, appropriate development and reclamation can more harmoniously be effected. Watershed considerations are such that they usually effect the method rather than the type of use and must be inherent in all land use plans.





LEGEND

-  INTENSIVE RECREATION
-  EXTENSIVE RECREATION
-  FORESTRY
-  AGRICULTURE
-  UNGULATE WINTER RANGE
-  UNGULATE HABITAT
-  WATERFOWL PRODUCTION

PREFERRED RENEWABLE RESOURCE ALLOCATION

NOTE: The allocation has been generalized to accomodate publication of the map at this scale.

SCALE : MILES



MAY, 1973



higher incomes, increased mobility and improved access to more of the region will all contribute to this rapid increase in use. The increasing demand will not be uniform in its effects on the region, rather it will be concentrated initially on those areas closest to the regional urban centres, and Edmonton, and will be focused on the well-developed transportation routes.

A demand which is closely associated with recreation is that for visitor service facilities. These facilities either service the traffic travelling to and from the recreation areas or provide intensive on-site services. Demand for both of these functions has already reached an intense level and is likely to continue to increase at a more rapid rate than that for recreation. Virtually all visitor services within Jasper National Park have surpassed capacity and the demand for these facilities appears to be oriented particularly at that portion of the Hinton-Jasper Corridor outside of the National Park.

Forestry

Forestry in the Athabasca River basin is dominated by the production of pulpwood for the integrated pulp mill and sawmill operation of North Western Pulp and Power Ltd. in Hinton. This plant is presently operating at capacity and produces approximately 198,000 short tons of kraft pulp and 50 million board feet of studs per year. Consumption has average 29 million cubic feet of pulpwood annually, since 1964 out of an annual allowable cut of 32.3 million cubic feet. The region could not satisfy the demand for another pulp mill but some expansion of the capacity of the existing mill could be accommodated by the forest resource of the region.

The region also has 10 sawmills which range in annual production up to 5 million board feet. These operations produce a wide variety of forest products including lumber, railway ties and round timber. The demand for production of non-pulp products in the region can be expected to increase by approximately 20% by 1985, with most of this increased demand being for softwood lumber. This demand can be completely satisfied within the annual allowable cut presently established for the region under the sustained yield forest policy.

Agriculture

The demand for agriculture in this region is very low due primarily to the adverse natural conditions. Some increase in demand for grazing land can be expected, but this should be of a local, small scale nature. Both cultivation of field crops and grazing can be more effectively accommodated in other regions in the province.

Fish and Wildlife

Angling, hunting and recreational observation are the three major demands on the fish and wildlife resources of the region. There is a substantial demand for angling at present due to the high quality of fishery resource in the region. The level of use is higher than that for hunting and is expected to increase faster than that for hunting. This rapid increase in the demand for angling is due to the excellent stream fishing available in the region, a feature unique to the

foothills, and the continuous provision or improvement of access to these streams.

The Athabasca River basin has a history of relatively intensive use for hunting, particularly for big game ungulates. The region cannot satisfy the existing demand for elk, mountain goat, caribou and bighorn sheep. Although elk are difficult to hunt in areas of dense vegetative cover, only a small supply of elk is available outside of the foothills. The region also contains a substantial portion of the supply of mountain goat and bighorn sheep which are not found outside of the Eastern Slopes. This areal limit on supply for these ungulates has focused demand on the foothills and has accelerated the approach to capacity use until now the region cannot satisfy the hunting demand for these species. Caribou are in such short supply that accommodation of hunting demands for this species may threaten the supply. If populations of each of these big game ungulates are to be sustained, more intensive game management will be required and an increasing percentage of use will have to be of the non-consumptive nature such as recreational observation and photography.

There is also a strong demand for moose and deer hunting in the region. However, demand for these animals can be satisfied throughout much of the province and therefore is not as dominant in this region. Populations of these animals can be sustained at the present level of use and the supply should adequately accommodate future demands for moose and deer if current management conditions are maintained.

The non-consumptive recreational use of the wildlife resources of the Athabasca River basin is presently at a low level. In association with the dramatic

increases expected in general recreational use of the region, the demand for non-consumptive wildlife use should also increase rapidly and must be considered in wildlife management plans.

Coal

The Athabasca River basin contains large quantities of coal suitable for carbonizing for use in the metallurgical industry. Although more detailed exploration will likely increase the reserves in the area substantially, present information places the reserves at approximately 9.3 billion tons.⁴ At present, Cardinal River Coal Ltd. operates the only coal mine in the region. This operation supplies coal to Japan on a 15 year contract for one million tons per annum and commenced shipment in 1970.

The demand for further development of the coal resources of the region will continue to emanate from the Japanese market as that nation attempts to diversify sources of coal imports. To contract coal sales it is usually necessary to be able to produce two million tons of coal per annum over a 15 year period. The supply of coal in the region is sufficient to satisfy the requirements for several contracts.

Quantities of high volatile bituminous coal are also present in the region. This coal is of low coking quality but is suitable for thermal use. There is presently no demand for this coal and these reserves are unlikely to be developed in the future due to presence of more economically retrievable deposits on the plains particularly in the Tofield area.

⁴ Tonnage is the total of probable and possible reserves. The recoverable portion should approximate 50%.

Petroleum and Natural Gas

The Athabasca River basin is presently a relatively small producer of oil and natural gas. However, the region contains a very significant supply of these resources and most of the region has been disposed to operators to retrieve these resources. The westward progression of oil and natural gas development will continue and with the serious continental energy resource shortages, the demand for oil and natural gas should increase rapidly, accelerating this progression of activity. (Author's note: At the time of writing, the United States has encountered such a critical shortage of petroleum products that rationing has been instituted in several regions.) In that this region has not been as extensively explored as other areas of the province, the rapid increase in demand should also produce a significant increase in the magnitude and rate of exploration in the region.

Country Residences and Small Holdings

The areas adjacent to communities are normally subject to intense demand for country residence acreages. The towns of Hinton and Edson are presently experiencing this situation and the trend is towards a further increase in the demand for this life style. For these towns, public lands will have to be made available if the demand is to be satisfied.

Since the demise of the coal industry in the Coal Branch in the 1950's, a new form of recreational use has appeared in that area which is based on the abandoned dwellings in the old townsites. Individuals have acquired leases for the dwellings and have converted them into mountain cottages or hunting lodges. This

use has become so popular that existing dwellings have all been leased and there is a rapidly increasing demand to have more land made available for this purpose . If this demand is to be satisfied, public lands will have to be made available and, as is the case with lakeshore cottages, considerable research will be required to ascertain the type and extent of use to be permitted and the environmental impact of this use .

RESOURCE USE IMPLICATIONS

The presence of a resource use affects the present and future capability of the resource base to support other uses as does the distribution of resource uses. This section will summarize the general effects that each resource use might have on the resource base both on-site and in relation to surrounding lands.

Energy Resources

Energy resources are relatively short-term uses of the surface environment. However, for the period of resource extraction the resource base is not available for renewable resource use and while in production, these uses can create serious jeopardy of the environment in terms of its future usefulness for renewable resource activities. Exploration damage is more widespread in this region than extraction damage although usually less extreme. Although each exploration site usually includes a relatively small area, thorough exploration of a large region produces a significant conflict with forest management and production. Lack of reclamation of these sites can also lead to serious erosion problems particularly in regions with extreme topography such as the region under discussion in this paper. The improved access is a positive consequence for recreation but this is significant only after reclamation has taken place if the aesthetic value of the area has been adversely affected. Use of the wildlife resources can also be increased by this improved accessibility to the resource but this is a positive consequence only within the constraint of adequate populations being sustained.

Erosion is the most serious consequence which can occur. In addition to its effects on the land resource, stream siltation is increased and has a very detrimental effect on the water regime of the region.

In summary, energy resource extraction can permanently damage the environment and render it unusable for other uses. However, if adequate site control management and reclamation are practiced, damage can be confined to the production site and may produce only short-term detrimental effects.

Forestry

The implications of forest production, and particularly the practice of clear-cutting, have generated a tremendous amount of discussion in the recent past. Forest operations present the potential for serious deterioration of the environment particularly in the areas of erosion, regeneration of a similar resource base and aesthetics. However, appropriate management practices can prevent or overcome these dangers very effectively. Even given good management practices, water regime changes are induced by logging and associated road construction. If logging occurs adjacent to streams, siltation will adversely affect the water quality which in turn harms fish populations. Detrimental effects on the water regime can be minimized and in some cases prevented by proper selection of the location and aspect of cutting areas and by use of slash - treatment techniques such as scarification to stabilize the soil base and prevent massive erosion.

Regeneration of the resource base is a condition set out in the contract for the Timber Management Agreement. The company is bound to satisfy

this condition for renewal of the contract and the long-term feasibility of the operation dictates that regeneration be successfully undertaken.

Aesthetic damage is inherent in the nature of the operation. However, again, management practices, such as green belts adjacent to access routes and water bodies, tend to minimize the importance of this factor.

The effect of forest operations on the wildlife resource is variable, depending primarily on the duration of time after logging. During logging and for the short-term future, the resource base is not usable by wildlife and pushes the animals onto other lands often creating a situation of overpopulation. However, in the long-term future, forest harvesting improves the habitat for wildlife by providing a better food supply and by giving the region the diversity of habitat which is essential to sustaining wildlife populations. Those species sensitive to human intrusion such as grizzly bear and caribou will be driven off by the activity and will be forced to search elsewhere for an undisturbed habitat.

Extensive recreation activities are generally compatible with forest operations and those requiring trails or open areas may be enhanced. High intensity recreation use areas require singular dedication of the resource base and will be detrimentally affected by forest harvesting.

Forest operations are completely compatible with mineral extraction as long as scheduling is arranged appropriately.

Agriculture and forest harvesting are in complete conflict.

Outdoor Recreation

Extensive recreation activities involve low densities of human use and cause virtually no conflict with other resource uses or deterioration of the environment. The more intensive activities require singular dedication of the resource base and may have adverse effects on the resource similar to other intensive uses. Many people think of recreation as a non-consumptive use but this remains true only as long as management practices prevent deterioration of the resource. Determination of user capacities and the use of reclamation practices are two factors which can prevent destruction of the recreation resource.

Visitor Service Facilities

Visitor service facilities are usually permanent in nature and preclude the use of the resource for other uses. It is of the utmost importance that the size of the development be established in association with the carrying capacity of the recreation areas it is serving. Recent construction and landscape architecture indicates that designs more amenable to the resource base can be developed and acceptance of this development parameter would ensure a minimum of aesthetic conflict.

Watershed Management

Watershed management may prohibit the intrusion of intensive uses into an area set aside to control water production. However, these areas are quite suitable for extensive recreation activities without danger of conflict.

When watershed considerations are limited to small scale measures such as site erosion control, little conflict with other resource uses is generated. Large scale water control projects such as dam and reservoir construction have considerable effect on other resource uses. The creation of a reservoir eliminates significant areas of land which may have high potential for forest production, ungulate winter range or recreational activities. If the reservoir site is not cleared of existing vegetation, the lake formed will have no potential for recreation or fish habitat and will create a visual scar on the landscape. If the reservoir bed is cleared, the lake can greatly increase potential for recreation, fish and waterfowl. The quality of downstream lands is usually enhanced by flow control structures which prevent flooding and erosion. Power generated from the dam is a positive economic factor and an inducement to industrial development.

Agriculture

Cultivation has virtually no potential in the Athabasca River basin, however, where it occurs it normally requires single purpose dedication of the land. Livestock grazing conflicts with big game ungulates and can be particularly damaging if the ungulates are restricted from using winter ranges.

Fish and Wildlife

Fish and wildlife resource use usually does not conflict with any of the other major resource uses. However, sustaining the populations of

certain species may require the establishment of areas within which no use other extensive recreation may be permitted.

Country Residences and Small Holdings

These uses requires a long-term singular dedication of lands but usually require relatively small areas of land. Strong locational controls and development standards can ensure a minimum amount of conflict.

SUMMARY AND CONCLUSION

The potential for resource use in the Athabasca River basin is vast, both in variety of possibilities and degree. At present, utilization of the resource base is at a relatively low level. However, the demands, both present and future, indicate a rapidly accelerated program of resource activity will soon engulf the region. If the region is not to become an area fraught with the problems of permanent environmental deterioration, misallocation of resources and serious use conflicts, clear policy guidelines and priorities will have to be established and followed by comprehensive long-range planning.

This paper has attempted to provide a reliable and consistent summary of information for the region which can be utilized as the basis for public participation. The paper confines itself to environmental considerations, but economic and social factors must also be taken into account. It is sincerely hoped that the public will blend together the information presented and attempt to derive an alternative for land use and resource development for the region which clearly indicates their preferences in terms of priorities, type, and degree of resource utilization and environmental constraints. The integration of resource uses is a factor which must be borne in mind throughout as the presence of a resource use has effects which often reach well beyond the activity site.

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